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Comments: From the SCS Chief

Getting Research Results to Farmers and Ranchers

Recently, the administrator of USDA's Cooperative State Research Service, J. Patrick Jordan, welcomed us to participate in workshops and meetings at State agricultural experiment stations.

I urge district officials and Soil Conservation Service employees to take Pat Jordan up on his invitation. I also urge you to include experiment station scientists in field demonstrations, seminars, training sessions, and other activities.

SCS shares with these scientists a commitment to soil and water conservation. We share a commitment to the Nation's farmers and ranchers to help them produce their crops at the least cost in financial and natural resources.

Every State, the District of Columbia, Guam, the Virgin Islands, Puerto Rico, Micronesia, and American Samoa all have at least one agricultural experiment station.

Experiment stations usually have several branch stations and substations so that problems specific to a particular area can be researched on the spot.

This is especially valuable in helping farmers to adopt no-till and other forms of conservation tillage. Farmers need specific information for their area on weed and pest control, cold or wet soil limitations, costs and returns of conservation versus conventional tillage, and effects on water quality.

I've visited many experiment stations around the country and have seen firsthand the fine work they are doing.

Details on some of their work can be found in an SCS report to research and education agencies and organizations, "1984 Soil and Water Conservation Research and Education Progress and Needs."

The report shows a growing trend among experiment station scientists to do more soil and water conservation research. Our role is to help farmers and ranchers use the information to their best advantage.

For SCS and conservation districts to do a good job of helping farmers put research to work, we must work more closely with researchers at all levels.

Let's begin today.

Cover: Terraces from the air. An Alabama farmer was one of the first in the Nation to install parallel terraces. See article on page 7. (Photo by Gene Alexander, audiovisual production specialist, SCS, Fort Worth, Tex.)

John R. Block
Secretary of Agriculture

Peter C. Myers, Chief
Soil Conservation Service

All programs of the U.S. Department of Agriculture are available to everyone without regard to race, creed, color, sex, age, or national origin.

Editor, Judith E. Ladd

Associate Editor, Nancy M. Garlitz

Assistant Editor, Donald L. Comis

Editorial Assistant, Ann P. Serota

Design Consultant, Christopher Lozos

News Briefs

Public Concern for Conservation Growing

Leaders from six U.S. Department of Agriculture (USDA) agencies participated in a panel discussion at a meeting of newly appointed State experiment station directors in Arlington, Va., in April. The USDA Cooperative State Research Service sponsored the meeting.

Representatives from the Agricultural Research Service, Economic Research Service, Forest Service, Extension Service, National Agricultural Library, and Soil Conservation Service discussed recent changes in their organizations, long-range planning, Federal research and experiment stations, and technology transfer.

"Competition for every available Federal dollar will be intense as we look for ways to reduce overall spending and trim the budget," said SCS Associate Chief David G. Unger. "But SCS still needs to continue improving its services to farmers, ranchers, and other landowners.

"To improve our services, we need better information, better equations, better formulas, and better classification systems. Research done at State agricultural experiment stations helps meet these needs."

According to Unger, SCS is encouraging its State and field office employees to work more closely with experiment station scientists.

Said Unger, "Together, we can identify the research that landowners need. You conduct the research," he told the group of experiment station directors, "and working with the Cooperative State Extension agencies, SCS helps farmers and ranchers to use the results.

"There is growing national concern for protecting our natural resources. This was apparent at a roundtable discussion on conservation strategy for the 1985 Farm Bill held in April at SCS Chief Peter Myers' farm in Missouri.

"Secretary of Agriculture John Block and leaders from USDA, State government, and farm and conservation groups agreed that we need a stronger link between USDA soil conservation and price support programs," said Unger.

"Another example of public concern is the increasing number of States who are adopting soil and water conservation legislation.

"This growing public support for natural resource protection should provide USDA and State research and conservation agencies new challenges and opportunities."

Nancy M. Garlitz,
associate editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

Reservoir Used to Recharge Ground Water

The Little Blue Natural Resources District (NRD) in southern Nebraska is building several dams to recharge a declining water table, as well as control flooding.

The Little Blue NRD covers parts of seven counties in the drainage basin of the Little Blue River. Three of these counties—Adams, Clay, and Fillmore—have been targeted for extra ground water conservation assistance by the U.S. Department of Agriculture.

Craig Pope, the ground water manager for the Little Blue NRD, says the first dam was built 2 years ago in Clay County and it has surpassed predictions about how much water would seep through the bottom of the reservoir to the aquifer. Instead of the predicted 800 acre-feet for the first year, Pope saw a recharge of more than 4,000 acre-feet for the first year. A county road superintendent told Pope the dam more than paid for itself in flood damages prevented during a major storm just 2 weeks after the dam was built.

The Little Blue NRD plans to build several dams in the Big Sandy Creek watershed where the first dam is, with the second scheduled to be finished this year.

Recharging aquifers with water seepage is one of the many ways farmers in ground water conservation areas are coping with the problem of a limited water supply. But Tom Hamer, the Soil Conservation Service State conservation engineer for Nebraska, warns that it may require an intensive study to determine if water seepage will actually go into the aquifer or just return to the surface downstream.

Pope says his district considered this and the possibility of ground water contamination from farm pollutants in runoff that finds its way into the reservoir. The University of Nebraska and the Nebraska Department of Environmental Control are helping to monitor water quality and they have found no problems at the first dam site. The University of Nebraska is also helping monitor the ground water levels.

The Little Blue NRD pays 25 percent of the costs of the dam building and the rest of the money comes from the Nebraska Natural Resources Commission and Federal grants. The Federal government donated land rights for the first dam, which is on Federal property.

Pope says the NRD's main goals for the watershed work are flood control and the use of surplus surface water for ground water recharge. He says the reservoirs will also provide supplemental irrigation water, recreation, and fish and wildlife habitat.

The Little Blue NRD sees ground water recharge as part of its overall ground water conservation efforts, which include irrigation scheduling, the use of gypsum blocks for moisture monitoring, terraces, cost sharing, renting a no-till planter to farmers, and ground water-use guidelines that become mandatory next year.

Working together with Federal, State, and local agencies, such as the Clay and Fillmore Counties Ground Water Conservation Districts, the Little Blue NRD is working to manage its surface and underground water wisely.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

SCS Tests Soil Erosion Economics Computer Program

This year, the Soil Conservation Service will test a soil conservation economics computer program called "SOILEC" in 10 to 15 States to help farmers develop conservation plans.

The program simulates soil erosion and the economics of soil conservation. It produces summary financial tables that rank farm management systems by costs of soil conservation per acre, costs per ton of soil saved, or by total annual soil loss. It can simulate results for any period from 1 year to 50 years.

In 1981 Agricultural Economists Bob Dumsday and Wes Seitz developed SOILEC at the University of Illinois in Urbana. Dumsday, an agricultural economist at Australia's La Trobe University, was a visiting professor at the time.

University of Illinois Agricultural Economists Bart Eleveld and Gary Johnson are developing SOILEC further under a cooperative agreement with SCS. Since the program only estimates sheet and rill erosion now, they are adding the ability to estimate wind and concentrated flow erosion. They are also changing it to show results for large areas such as farms and watersheds as well as results per acre.

The program is stored in a mainframe computer at the U.S. Department of Agriculture's Washington (D.C.) Computer Center and a version is available for microcomputers.

For more information, contact R. M. Gray, director, Economics Division, Soil Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, D.C. 20013-2890.

Donald L. Comls,
assistant editor, *Soil and Water Conservation News,* SCS, Washington, D.C.

Dead Chickens Go Underground

A Natchitoches Parish, La., poultry farmer John Ammons says it's been a lot cleaner and more pleasant around his chicken farm lately. He credits the improvement at his two-house broiler operation to his three poultry disposal pits.

Ammons, like other poultry growers in Louisiana, had had a problem with properly disposing of birds that died during normal operations. Often dead birds were dumped in the woods or on field borders.

But dead poultry left in the woods can spread disease to livestock or wildlife grazing in the area. The dead birds also attract scavengers such as buzzards and coyotes.

In 1978, a poultry processing plant opened in Natchitoches. As the number of poultry growers in the area increased, so did the problem of disposing of dead chickens.

The Natchitoches Soil and Water Conservation District worked with the Soil Conservation Service and other groups to help solve the problem.

Through the conservation district, SCS provided technical assistance on designing underground poultry disposal pits, which give farmers a safe and sanitary way to dispose of dead chickens.

SCS technicians help farmers choose a site for the pit, or pits, according to soil conditions. The disposal pits must be located in a heavy clay soil and away from a high water table. Other considerations in choosing a site should be distance from wells and easy access. The pits must also be out of the pathways of people and vehicles.

SCS recommends the number and size of disposal pits a farmer needs according to the kind and size of the poultry operation. The agency recommends 50 cubic feet per 1,000 laying chickens and 100 cubic feet per 10,000 broilers. But a pit can be no larger than 12 feet by 6 feet by 6 feet.

Poultry farmers hire contractors to dig out the pits and a liner, made of pine treated to underground specifications, is lowered into the hole. The pine liner is open at the bottom and the horizontal side boards have about a 4-inch space between them.

A lid made of two layers of pine boards running perpendicular to each other is put on top. Through holes cut into the lid, 6- or 8-inch diameter plastic pipe is inserted and fastened and fitted with a plastic lid. Two pipes are installed for larger pits. The wooden liner lid is covered with soil which is graded to direct water away from the pit. Farmers lift the lid on the plastic pipe and drop the dead chickens in. The pits cost about $600 to $800 to install.

Posting warning signs or installing fences and access gates should be considered at disposal pits that pose a possible health or safety hazard. An example would be at a pit close to a driveway or other frequently traveled area.

In April 1981, SCS sponsored a field day at Ammons' farm to demonstrate how poultry disposal pits are installed and discuss how they work. There were discussions on materials, construction, and proper placement.

So far, Natchitoches Parish poultry farmers have installed 90 disposal pits with SCS technical assistance, and almost all of the poultry farmers in the parish now have at least one disposal pit on their property. Excellent coverage by a local television station and local newspapers has helped to make the practice so well accepted.

Ben Dobson,
district conservationist, SCS, Natchitoches, La.

Soil Erosion—A Global Problem

"The excessive loss of topsoil anywhere ultimately affects food prices everywhere," according to *State of the World—1984,* a new study by the Worldwatch Institute, a research group in Washington, D.C.

"Despite the recent economic upturn in the United States, the global economy will continue to suffer without more careful management of the natural resources that support it," said Lester R. Brown, president of Worldwatch Institute and director of the study.

Said Brown in a chapter on conserving soils, "Under pressure of ever mounting demand for food, more and more of the world's farmers are mining their topsoil. Soil erosion has now reached epidemic proportions, and its effect on food prices could ultimately be more destabilizing than rising oil prices.

"Mismanagement of the world's soils now poses the most serious threat to long-term economic progress. The world is losing unprecedented amounts of topsoil, and no major food producing country, industrial or developing, has responded effectively to this threat to sustainable agriculture."

The Worldwatch report said that close to half the world's cropland is losing topsoil at a debilitating rate. Even in the United States the loss of soil through erosion exceeds new soil formation on over one-third of the cropland. Brown said that the U.S. crop surpluses, sometimes cited as a sign of a healthy agriculture, are at least partly the product of plowing highly erosive land that should not be cropped.

"Assuming there is still an average of 7 inches of topsoil on the world's cropland," said Brown, "there are some 3.5 trillion tons of topsoil that can be used to produce food. If erosion on cropland exceeds new soil formation by 23 billion tons per year, topsoil reserves will disappear in about 150 years, only a few decades after the exhaustion of recoverable reserves of oil."

Besides soil conservation, other areas where the Worldwatch report found inadequate progress include stabilizing population, developing renewable energy resources, recycling materials, and protecting biological support systems such as forests.

State of the World—1984 is the first in an annual series of global assessments by Worldwatch Institute on how changes in the resource base affect the world economy. The reports, launched with the support of the Rockefeller Brothers Fund, are intended to measure success in managing resources for sustainable economic progress.

Copies of the study are available for $15.95 from the Worldwatch Institute, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036.

Nancy M. Garlitz,
associate editor, *Soil and Water Conservation News,* SCS, Washington, D.C.

National Institute Named to Study Waste Management

The University of Alabama has announced the formation of an institute of internationally distinguished scientists to study environmental issues related to hazardous and nonhazardous waste disposal.

Chartered as the University of Alabama Environmental Institute for Waste Management Studies, the group is made up of professors at major research universities who are experts in the fields of geology, toxicology, chemistry, socioeconomics, and engineering. The purpose of the institute is to study the technical, social, and economic issues related to safe management of the Nation's wastes and to make the findings available to Congress, State legislatures, governmental agencies, and the public.

The Institute will emphasize the study of storage, treatment, and disposal methods as well as state-of-the-art technologies necessary to develop a national waste management policy. Major programs will center on consolidation of research and technology. In addition, the Institute will work toward advancing understanding of solid waste issues and technology through reports, conferences, and seminars that address topics such as treatment and disposal options, site evaluation, classification of wastes, and environmental monitoring.

The Institute's first work product will be development of a strategy for managing spent solvents and solvent-contaminated wastes, a study expected to be completed by January 1985.

Community Improvement Awards Entries Due

Keep America Beautiful, Inc., (KAB) invites organizations to participate in its 1984 National Awards Program.

The awards program honors organizations for community cleanup projects. There are nine categories: statewide organizations or commissions; civic organizations; youth groups; schools; local business/industry; statewide, regional, or national business/industry; communications; local government; and State/Federal agencies.

To be eligible for an award, a program must work to create a cleaner, better environment; be a continuing effort; involve citizen education and action; and include, but not be limited to, activities that reduce litter or encourage recycling.

KAB also invites applications for a separate awards program, the Mrs. Lyndon B. Johnson Award, for "woman leaders of the environmental/beautification movement in the tradition of the former First Lady."

The deadline for both awards programs is August 31. For entry forms and brochures describing the programs, call Tim Johnson in the KAB Communications Department at (212) 682–4564. Or write to him at Keep America Beautiful, Inc., 99 Park Avenue, New York, N.Y. 10016.

Babies and Beasties

A Babies and Beasties class at the Austin Nature Center in Texas is introducing children 1½ to 2½ years old to wildlife.

A major goal of the class is for the children to recognize some ways that people and animals are different and alike.

Groups of 10 to 12 children, each accompanied by a parent, meet weekly for three 45-minute sessions.

An Outreach Program supervisor for the City of Austin Parks & Recreation Department, Christine Revalas Fogg, originated the program. "Through positive experiences with things found in nature," said Fogg, "children become more aware of the plants and animals that share our planet with us and care more about them. The aim of the program is to help build this foundation of awareness and caring."

In the first session of the Babies and Beasties class Fogg says that the children are naturally a little apprehensive. To ease the tension Fogg or another teacher leads the children in pointing to their own eyes, their parents' eyes, and the eyes of another mammal.

"In another activity the children feel their heads, fingers, and ribs to learn about bones," said Fogg. The children can touch bones, furs, feathers, and mounted wildlife specimens and see and touch small live animals common to central Texas.

The second session is on birds. The children learn that birds are different from themselves because birds have wings, feathers, and beaks. They also talk about how birds can fly and people can't.

The third and last session is the reptiles class. During this session Fogg says that the children walk around the room and examine turtle shells and snake skins and watch live snakes and lizards. They talk about how these animals are different from people.

Since the Babies and Beasties class began 4 years ago, about 400 children have participated in it. Many of the children go on to take the Fur, Feathers, and Friends class for 3- and 4-year-olds and the Explorers class for 4- and 5-year-olds.

"By the time they're 5 years old, the children know all of the specifics about king cobra snakes, for example," said Fogg, "but the overall picture of how animals relate to each other is still cloudy to them. Programs for their later years help put the puzzle together."

The Austin Parks & Recreation Department sponsors the preschool programs in exploring nature as well as many other nature study activities for older children and adults.

Adapted from an article by Mark R. Peterson, associate director of the Sigurd/Olson Environmental Institute, Ashland, Wis., in the Fall 1982 issue of the American Society for Environmental Education Newsletter.

Toddler meets turtle. Christine Fogg, originator of the Babies and Beasties class, teaches one of the participants how reptiles differ from humans.

Still Willing to Try Something New

Innovative farmers, like Olaff S. Ivey in Houston County in southern Albama, and the Soil Conservation Service employees who help them, have kept the soil and water conservation movement strong. In 1950, Ivey was one of the first farmers in the Nation to install parallel terraces and is still a leading conservationist today.

"Ivey asked us to help him build some terraces that would fit his new four-row equipment, and he was willing to try something new," said Charlie Harper, area conservationist for SCS in the 11-county Wiregrass area. Harper, who was a beginning soil conservationist in Houston County at the time, helped lay out the terraces.

"While Ivey built his parallel terraces, many SCS employees and farmers came to watch and learn," said Harper. "In fact, SCS and conservation district members sponsored tours of Ivey's farm, and people from all over the United States came to see the parallel terraces."

Ivey now has parallel terraces on 284 acres of his gently sloping and highly erosive 600-acre dairy farm. "And those original terraces are about the same as when they were built," said Ivey, "except that we have replaced the grassed waterways with underground pipe outlets to carry water down the slope." Ivey explained that the pipe outlets are easier to work around with farm machinery and require little maintenance.

"Much of the land in Houston County was terraced in the fifties and sixties, but unlike Ivey, many farmers built the old type of terraces that follow the contour of the land because they were less expensive and easier to build," said SCS District Conservationist Thomas Hughes. "These terraces are unevenly spaced and difficult to operate farm machinery on. They are difficult to maintain and farmers eventually plow them down.

"In the last 8 to 10 years, we've helped farmers replace their old terraces with parallel terraces on much of the county's cropland.

"Most of the county's farmers with parallel terraces use underground plastic pipe like Ivey instead of grassed waterways to carry excess water safely down the slope. The pipe is usually 6 to 8 inches in diameter," said Hughes.

"We recommend spacing the terraces 108 to 144 feet apart to allow for an even number of crop rows between terraces. This helps farmers to use their equipment more efficiently and makes it easier for them to grow their crops on the contour.

"The best thing about parallel terraces in Houston County," said Hughes, "is that they keep gullies from forming in the sandy soil."

Farmers can now receive up to 60-percent cost sharing through the Agricultural Conservation Program of USDA's Agricultural Stabilization and Conservation Service to help pay for the parallel terraces. The terraces cost about $150 to $200 an acre to install and farmers can receive a maximum of $3,500 in cost sharing per year.

Ivey's three sons now help him run the farm and concentrate on producing forage crops for their 300 dairy cattle. The Iveys grow corn, grain sorghum and alfalfa for silage, and rye and oats for winter grazing in addition to other crops.

Ivey and his sons began growing alfalfa recently. "I don't know how we could do without it," said Ivey. "Even the little calves go for alfalfa."

"Alfalfa also fits in well with the crop rotations needed to reduce soil erosion," Hughes said.

The Iveys plant alfalfa for 4 years followed by 1 year of grain sorghum and 1 year of corn before going back to alfalfa. Ivey said that they have made as many as six cuttings of alfalfa per year yielding up to 5 tons per acre.

Because the first cutting of alfalfa is difficult to cure for hay, the Iveys use it for silage. Ivey said that he likes the Cimarron variety of alfalfa and plants it in October at the rate of 20 pounds per acre. He applies fertilizer and lime according to soil test recommendations. The Iveys grow alfalfa on Dothan sandy loam soil and suggest that any farmer considering growing alfalfa use a soil map to locate the soil best suited to the crop.

Last year, the Iveys used no-till and reduced tillage on 330 acres of corn, soybeans, peanuts, and grain sorghum and are planning to increase their acreage of conservation tillage. Whether they use no-till or a form of reduced tillage depends on how soon in the spring the ground begins to warm up and on other weather conditions.

Since 1959, Ivey has been chairman of the Houston County Soil and Water Conservation District. His strong conservation ethic has guided the management of his farm for 34 years. Said Hughes, "Ivey and his sons are as innovative today in their farm management as Ivey was in 1950."

Morris Gillespie,
public affairs specialist, SCS, Auburn, Ala.

Conservation Tillage Is on the Rise in Eastern New Mexico

Conservation tillage is beginning to catch on in eastern New Mexico thanks to the efforts of the Central Curry and Roosevelt Soil and Water Conservation Districts.

This year farmers from New Mexico and West Texas met at the fourth annual conservation tillage seminar in Curry County, N. Mex. The seminars are held in New Mexico every other year, alternating with West Texas.

Eastern New Mexico and West Texas are both in the windy Great Plains and share the same hazards of growing crops—mostly wheat, grain sorghum, and corn—in a semiarid area. They also have a common way to reduce those hazards—conservation tillage.

When the seminars began, there was only one conservation tillage farmer and no conservation tillage equipment dealers in the two counties. Now at least a third of the farmers use conservation tillage and many dealers sell equipment for it.

Last year, the seminars inspired farmers to begin a local conservation tillage association, with SCS help. The association holds monthly meetings so neighbors can learn from each other.

In 1983, the Agricultural Stabilization and Conservation county committee in Curry County accepted conservation tillage for cost sharing. This year, Quay County, which is just north of Curry, did the same.

Wes Robbins, the Soil Conservation Service conservation agronomist for Quay, Curry, and Roosevelt Counties, has been pushing conservation tillage since the early seventies, when he began helping farmers to develop no-till drills in Texas.

Now he spends his time convincing New Mexico farmers to switch to conservation tillage and helping them modify their equipment for it. Robbins says he likes to dig holes in farmers' fields to show them why unnecessary tillage is bad.

In over-tilled fields, he shows farmers soils whose structure is destroyed, with compacted layers that restrict water flow and root development. There are few earthworms in these fields.

In conservation tillage fields he shows them loose soils, conditioned by freezing and thawing and digested by earthworms. Farmers can see the undisturbed root paths from the previous crop and the earthworm tunnels.

The crop residue cover left on conservation tillage fields insulates the seedbed and reduces soil moisture evaporation by sun and wind. It also traps blowing snow and slows water runoff. By reducing runoff and holding soil in place, conservation tillage significantly reduces soil erosion and saves water.

SCS District Conservationist Hugh Lackey, Roosevelt County, says, "Conservation tillage eliminates one or two irrigations and several tillage trips, saving fuel and the cost of pumping water. That helps farmers stay in business. Conservation tillage is definitely increasing in Roosevelt County."

Dick Shaw, SCS district conservationist in Curry County, reports that last year farmers in his county used conservation tillage on 36,000 acres of dry and irrigated land.

Robbins credits USDA's Agricultural Stabilization and Conservation Service, Extension Service, and SCS—in cooperation with soil and water conservation districts—and farm supply dealers for the conservation tillage bandwagon that began rolling with the first seminar and is still picking up speed.

Scotty Savage,
soil conservationist, SCS, Clovis, N. Mex.

Betty Joubert,
public affairs specialist, SCS, Albuquerque, N. Mex.

No-Till Boosts Yields After Irrigated Crops

The U.S. Department of Agriculture's Agricultural Research Service (ARS) Conservation & Production Research Laboratory in Bushland, Tex., has found a winning combination: no-till dryland grain sorghum planted on chemically fallowed land 11 months after an irrigated wheat crop is harvested.

In a study which began in 1973 and ended in 1978, Paul Unger, an ARS soil scientist at the Bushland lab, and Allen Wiese, a Texas Agricultural Experiment Station (TAES) professor of weed science stationed at Bushland, compared several levels of tillage for the fallow land and found that no-till produced average grain sorghum yields of 2,800 pounds per acre, compared to 1,720 pounds per acre with disking. Similar results were obtained in a later study.

The Bushland researchers have found that only an irrigated crop can leave enough residue to significantly increase rainfall storage during the fallow period, which takes at least a ton of residue per acre. Irrigated wheat produces from 2 to 5 tons per acre, which can double the amount of rainfall stored.

This increased water storage increases the stability of dryland farming. The lower costs of no-till combined with the markedly higher yields—more than 1,000 pounds per acre higher—mean more profits. And the high levels of residue greatly reduce the threat of soil erosion by wind and water.

B. A. Stewart, an ARS soil scientist and director of the Bushland lab, said, "You have to match cropping systems to different areas. The irrigated wheat-fallow-dryland grain sorghum system is best suited to soils such as Pullman, which are deep and very slowly permeable." Pullman soils cover about 75 percent of the land surface of 21 counties in the Texas High Plains, mainly south of Amarillo and north of Lubbock. "On the less clayey soils around Lubbock, for example, crops can use the soil water more efficiently and continuous cropping is possible without a fallow period."

For the past 15 years, Wiese and Unger, along with ARS agricultural engineers Jack Musick and Ron Allen, have studied various conservation tillage systems for irrigated and dryland grain sorghum, corn, small grain, wheat, and cotton. Wiese is also testing controlled droplet applicators (CDA's) and other methods of reducing the volume of herbicide spray carrier. So far, he has found that reducing the volume of spray carrier for paraquat and glyphosate makes the herbicides more effective.

Wiese is also testing the irrigated wheat-fallow-dryland sorghum system with a Limited Irrigation-Dryland (LID) system. (See following article.) For the past few years, ARS soil scientist Reggie Jones has been studying conservation tillage with dryland wheat-fallow-dryland sorghum and continuous dryland wheat.

Wyatt Harman, a TAES research economist at Amarillo, is working with Wiese to study the economics of LID and other systems. Harman, who operates a farm with his brother, says this year they will plant all sorghum and cotton—mostly dryland— with conservation tillage.

Wiese and Harman are testing conservation tillage with dryland wheat rotated with dryland cotton. Harman says that although there have been no statistically significant increases in cotton yields in the past 3 years, there were other benefits, such as wind erosion control and savings in equipment use, labor, and time. Cool temperatures and hail cut crop yields for 2 of the 3 years.

The cooperation of Harman and Wiese with ARS typifies the close relationship between ARS and TAES, the Soil Conservation Service, and the Extension Service. The agencies work side by side on farms and at field days and meetings with farmers.

Harman says their work has given farmers many conservation tillage options to choose from.

Putting LID on Water Losses

Scientists at the U.S. Department of Agriculture's Agricultural Research Service (ARS) Conservation & Production Laboratory in Bushland, Tex., say combining irrigated and dryland crops is the most efficient way to use irrigation and rainwater.

The idea, known as the Limited Irrigation-Dryland (LID) system, is to grow irrigated crops at the upper end of graded furrows and dryland crops at the bottom end. The dryland section acts as a sink, soaking up any excess water that leaves the irrigated section, eliminating most tailwater runoff.

The actual size of the irrigated section depends on the amount of rainfall received. After a rain, the furrows are smooth all the way down the field and the irrigation furrow streams advance farther. During a dry spell, the furrow streams can't move as far down the field because more water infiltrates into the soil near the upper end of the field. During a dry season irrigation water is automatically concentrated in the uppermost part of the field, where it can adequately water crops. This is better than pumping more water over more land than can be adequately watered in a dry year.

To match the reduced amounts of water at the lower end of the field, the ARS scientists vary the seeding rate, spacing the seeds farther apart as they move down the rows.

And when it does rain, LID farmers, unlike traditional irrigators, have room for the rain as well as the irrigation water, since they irrigate only every other furrow. The nonirrigated furrows are not saturated with irrigation water so they can absorb the rain even if it occurs during an irrigation. To hold as much rain as possible, LID farmers use special tillage equipment to build dams at about 4-yard intervals to form a series of basins in the nonirrigated furrows.

For the past 5 years, B. A. Stewart, director of the Bushland lab, along with colleagues Jack Musick, an ARS agricultural engineer, and Donald Dusek, an ARS agronomist, grew grain sorghum with LID.

They tried LID with different amounts of irrigation water—an average of 5, 7, and 9 inches applied each year. For the first 3 years, they report that average yields of grain sorghum rose from 3,991 pounds per acre on plots with 5 inches of water applied, to 5,080 pounds per acre on plots with 9 inches of water applied.

This more than 200-pound yield gain per inch of water applied is much higher than, and in many cases double, the value for irrigated grain crops in the Southern High Plains. Normal, fully irrigated plots, with 20 inches of water applied each season, yielded 6,464 pounds per acre. The LID fields produced almost 79 percent of the yield of the fully irrigated plots with about half as much water.

Because of the drastic reduction in the amount of water used, Stewart says LID "could sustain irrigation for a longer period in areas of the Southern High Plains where ground water supplies are being depleted."

There are limitations to LID. Because of limited leaching with LID, it will not work in areas that need leaching to remove salts from irrigation water. LID will work only with drought-tolerant crops, which in Texas means grain sorghum, cotton, and wheat. Some Texas farmers are already using LID for sorghum and wheat.

The ARS researchers at Bushland have also tested surge-flow irrigation (see article in the May 1984 issue of *Soil and Water Conservation News*) with LID, to push the irrigation streams a little farther down the furrows.

One problem Stewart sees with LID is how to fertilize at rates that match the varying seed and irrigation rates. He thinks the answer is to put the fertilizer in the irrigation water so it goes only where the water goes.

Donald L. Comls,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

Tennessee Researchers Find No-Till, Double-Cropped Soybeans Cut Erosion

Results from 4 years of tillage research at the University of Tennessee Agricultural Experiment Station at Milan show no-till cuts soil erosion drastically with little difference in yields.

The scientists tested five soybean tillage systems on ¼-acre plots—conventional-till single crop; conventional-till after wheat; no-till soybean stubble; no-till in wheat stubble; and drilled. Measurements from selected storms during April to July over the past 4 years showed soil loss from the no-till in wheat stubble was only 7 percent of that from the conventional-till after wheat. Soil loss from the conventional-till after wheat was only 14 percent of that from the conventional-till single crop.

This is because the wheat crop is growing from April to June, and provides a protective canopy during part of the highly erosive rainfall period from April to July. The researchers found that controlling erosion is a matter of leaving the soil undisturbed and covered with either a crop canopy or surface residue during those critical 4 months.

The plots with conventional-till, single-crop soybeans had the most erosion, with drilled soybeans running a close second. Although drilled soybeans form a canopy more rapidly than row soybeans, the way the seedbed is prepared leaves soil more vulnerable to erosion for about a month during the critical rainfall period, before the soybeans form a canopy.

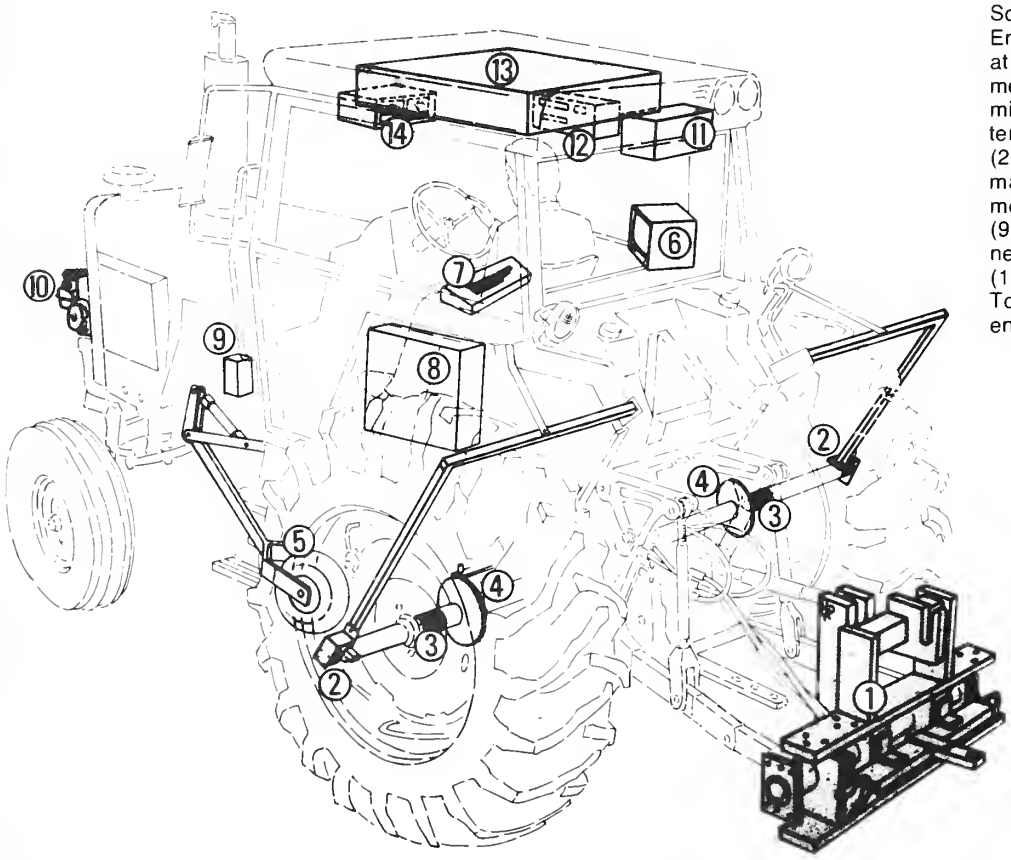
University of Tennessee Agricultural Engineer Curtis Shelton, who is leading the research, says one practical solution suggested by this research is alternating strips of no-till soybeans with strips of conventional-till soybeans.

This would allow cultivation for weed control every few years, ease pressures on farmers by allowing them to till less land each year, and cut the risks of both erosion and lower soybean yields caused by delayed planting.

Shelton, working with Agricultural Engineer Fred Tompkins and Plant and Soil Scientist Don Tyler at the University of Tennessee, analyzed runoff from both rainstorms and simulated rainfall from April to July each year.

The research plots, with average slopes of 5 to 8 percent, are on a highly erodible soil—Lexington silt loam—which is common to West Tennessee. Shelton says the way farmers grow soybeans on such soils accounts for much of West Tennessee's average cropland soil erosion rate of 30 to 40 tons per acre per year. Conservation tillage can slash this rate.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.



Schematic of a tractor used by Agricultural Engineer Fred Tompkins for tillage research at the University of Tennessee Milan Experiment Station. The tractor is outfitted with a microcomputer-based data acquisition system. Components include (1) dynamometer, (2) slip ring, (3) strain gages, (4) gear and magnetic pickup, (5) fifth wheel, (6) video monitor, (7) keyboard, (8) signal conditioner, (9) fuel transducer, (10) generator, (11) magnetic tape recorder, (12) fuel meter display, (13) microcomputer, and (14) panel meters. Tompkins used the tractor to measure the energy requirements for tilling and planting.

Porous Asphalt Reduces Stormwater Runoff

A new method of using porous asphalt can help return stormwater runoff to ground water supplies for cities as well as agricultural areas, while eliminating puddles on roadways, keeping tires from skidding, and minimizing road glare. The new method is called full-section porous asphalt, indicating that the porous material is applied directly over a gravel bed, instead of over or under regular asphalt, as it has been up to now.

Because its high-friction surface reduces skidding in rain and snow, porous asphalt has been used as a top layer over concrete on airport runways in Europe and the United States, and on streets in several U.S. cities since the sixties. When used as a base layer under regular asphalt, porous asphalt helps prevent cracking of the pavement by providing rapid water drainage.

Porous asphalt is manufactured by the same process as regular asphalt, but only larger sizes of gravel—between 1/10 to ½ inch in diameter—are used. The result is a water-permeable lattice. Full-section porous asphalt diverts storm runoff through the asphalt surface into the ground, according to geologist James B. Urban, who led the research team at the Agricultural Research Service (ARS) Northeast Watershed Research Center, University Park, Pa. To build full-section porous asphalt, the material is layered over a gravel bed. The permeability of the underlying rock is tested to determine the proper thickness of gravel to use. Rainwater can drain through the asphalt surface and collect in the gravel bed until it percolates into the ground.

Urban and ARS hydrologist William J. Gburek tested full-section porous asphalt for 5 years at ARS's Storm Water Detention and Ground Water Recharge facility near Willow Grove, Pa. The Pennsylvania Department of Transportation, Materials Testing Division, cooperated in the design of the test facility and specifications for the asphalt.

Full-section porous asphalt is strong enough to support the light-duty traffic encountered in parking lots. Successful application of the porous asphalt technique to a site requires favorable conditions: slope less than 2 percent, well-drained soil and permeable bedrock, and water table depth greater than 10 feet. High summer air temperatures (90 to 100° F) can produce asphalt temperatures of 120 to 140° F, resulting in potential damage to the pavement surface by traffic. Observations during severe weather conditions indicate that the porous asphalt layer does not seem to be affected by freeze/thaw conditions, and remains relatively skid resistant during both wet and freezing weather.

The scientists recorded the infiltration of stormwater under grass, full-section porous asphalt, and regular asphalt. "Almost no water seeped through the conventional asphalt; most of the water was lost through runoff. Grass and full-section porous asphalt were almost equally effective in reducing runoff during the growing season," Gburek says.

About 75 percent of the rainwater seeped through the full-section porous asphalt into the ground water supplies, Urban says, contrasted with approximately 20 percent under a grassy plot and close to 0 percent under regular asphalt. The water table under the full-section porous asphalt rose about 2 to 5 feet for each inch of rainfall at the test site in Pennsylvania. The ground water level started to rise 2 hours after a storm began, and began to drop about 6 hours after the storm.

"Full-section porous asphalt is much more effective than grass for recharging ground water," Urban says. During the growing season, grass and other plants use the water in the upper soil layers, preventing it from reaching the water table.

ARS researchers believe that construction of high-infiltration porous asphalt surfaces can reduce downstream flood peaks and storm runoff volumes, while increasing recharge to local aquifers. Full-section porous asphalt can be an important addition to the soil conservationist's water management tools.

DRAINMOD: A New Engineering Tool

Soil Conservation Service engineers are using a computer simulation program to test designs for combination drainage and subirrigation systems.

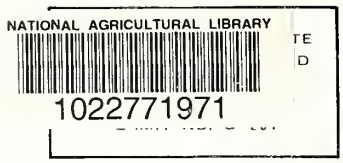
Called "DRAINMOD" (for Drain Model), the program simulates the effect of a system on water table fluctuations over a period of at least 20 years, using detailed soil data, past records of hourly rainfall, and daily maximum-minimum temperatures.

Wayne Skaggs, an agricultural engineer at North Carolina State University at Raleigh, developed DRAINMOD and is now helping SCS use it, after extensive testing in North Carolina, Louisiana, and Ohio. Limited testing was also done in Florida, California, and Israel.

SCS has introduced DRAINMOD for use in humid sections of the United States but is still testing it for arid and semiarid climates. In addition to using DRAINMOD for drainage-subirrigation systems, SCS can use it to design complex subsurface and surface drainage systems, including those for onland disposal of wastewater.

Within the next few years, SCS hopes to expand the program to simulate effects on crop yields, water quality, and salinity. Looking to the day when all SCS field offices have microcomputers, SCS is working with a private computer institute and Extension Service specialists in the Midwest to adapt the program for microcomputers. Presently the program is stored at the U.S. Department of Agriculture's Washington (D.C.) Computer Center and can only be reached by other computers via telephone.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.



New Publications

Cost Data for Landscape Construction, 1984

by Kerr Associates, Inc.

The fifth edition of this publication contains 247 pages of current unit prices to help designers and contractors solve special estimating problems associated with site and landscape development.

The following information is listed in numerous tables: a detailed description of the work item; unit of measurement; crew and equipment used; material cost; installation cost; and total cost.

New in this edition are a major expansion of the architectural fountains data and the addition of stucco costs. Several types of landscape bollards, bus stop shelters, and playground safety paving have also been added. More wood preservation options are now offered and landscape maintenance data now include snow shoveling and litter pickup.

Copies of this publication are available for $28.75 (plus $1.25 for postage and handling) from Kerr Associates, Inc., Suite 100, 1942 Irving Avenue South, Minneapolis, Minn. 55403.

Desertification of Arid Lands

by H. E. Dregne

As the third volume in a series of books on the advances in desert and arid land technology and development, *Desertification of Arid Lands* is a publication designed to bring an interdisciplinary approach to the problems of desert technology and development. This particular series includes original work and review articles covering science, technology, engineering, agriculture, architecture, sociology, management, and economics of desert and arid land utilization and development.

In addition, this book focuses on human-caused desertification, the processes involved, indicators, causes and control, and the worldwide severity of the problem. The effect of urban development, mining, tourism, recreation, and woodcutting on the degradation of land resources is described, as well as the effect of agricultural practices. Impediments to the implementation of desertification control measures are also discussed, including the socioeconomic factors as well as the technical factors.

Copies of this book are available for $33.25 from Harwood Academic Publishers, P.O. Box 786, Cooper Station, New York, N.Y. 10276.

Our Soils and Their Management

by Roy L. Donahue, Roy Hunter Follett, and Rodney W. Tulloch

In the fifth edition of *Our Soils and Their Management,* the authors provide the knowledge that farmers and students need for the best use of soil and water resources and for good soil fertility management.

This revised resource guide is filled with valuable information outlining the requirements for success in farming and ranching. It also helps the reader to understand plants and their soil adaptations, water requirements, and fertility needs.

The authors have prepared an up-to-date and complete book on the subject of soil management. The discussion is clear and down-to-earth. The illustrations, which are used profusely, are also apt and clear. The guide will be valuable to students of soil science, farmers, ranchers, foresters, engineers, builders, waste disposal specialists, and almost everyone who has been challenged by a home garden or an unruly lawn.

The 622-page book is available for $23 from Interstate Printers and Publishers, Inc., P.O. Box 594, Danville, Ill. 61832.

No-Tillage Agriculture: Principles and Practices

Edited by Ronald E. Phillips and Shirley H. Phillips

No-Tillage Agriculture is an extremely useful guide which explains the principles and practical aspects of the no-tillage system and its advantages over more traditional crop production methods. The book examines the application of no-tillage principles to various soil and climate conditions; the complex interactions of soil, crop, and environment; and the role of the farmer.

This valuable resource guide also analyzes the effects of climate and soil characteristics on crop production, as well as changes in soil properties due to the use of no-tillage methods. Principles of efficient use of fertilizers, lime, cover crops, equipment, herbicides, and pesticides are also presented.

In addition, the book outlines some of the benefits of no-tillage, including reduced soil erosion, lower energy costs, lower labor requirements, conservation of soil water, and less machinery. Both small-scale farmers and large-scale commercial farmers will find this guide very beneficial.

The book may be obtained for $34.50 from the Van Nostrand Reinhold Company Inc., 135 West 50th Street, New York, N.Y. 10020.

Land Drainage: Planning and Design of Agricultural Drainage Systems

by Lambert K. Smedema and David W. Rycroft

Over the years the planning and design of agricultural drainage systems has become a major concern to many farmers because in areas of irrigated farmland, proper drainage is of fundamental importance to maintaining productivity. To help formulate a greater understanding of land drainage among students, teachers, professionals, and farmers, the authors of this text specifically discuss the diagnosis and solution of agricultural drainage problems.

The authors cover all the major drainage problems in six sections: (1) basic soil and water; (2) drainage systems: components, functions, construction, operation, and maintenance; (3) planning and design: design variables, criteria, and procedures; (4) soil salinity control; (5) miscellaneous drainage problems; and (6) investigations (surveys, economic evaluation).

The book is analytical in approach and provides a clear understanding of what is physically or chemically occurring in the soil and on the land at each stage of the drainage process. Offering theory that has been tested in practical application around the world, *Land Drainage* has been prepared as a modern textbook for a university level land drainage course.

The book may be obtained for $32.50 from Cornell University Press, 124 Roberts Place, Ithaca, N.Y. 14850.

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